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Applicant: OMRON TATEISI ELECTRONICS
 CO.
 10, Tsuchido-cho Hanazono Ukyo-ku
 Kyoto 616(JP)

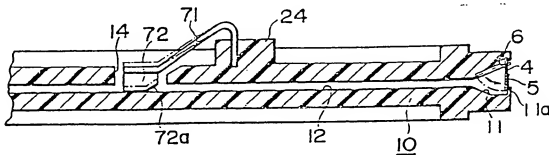
Inventor: Mita, Katsuya c/o Omron Tateisi
 Electronics Co.
 (Patent Center) 20 Igadera Shimokalinji
 Nagaokakyo-shi Kyoto 617(JP)

Representative: WILHELMS, KILIAN &
 PARTNER Patentanwälte
 Eduard-Schmid-Strasse 2
 D-8000 München 90(DE)

IC card reader.

A shutter (4) is attached to an inserting port (11) of an IC card reader so as to be freely opened and closed. A cleaning member (5) is attached to the outer surface of the shutter. When an IC card (1) is inserted into the IC card reader, the shutter is opened by a pressing force of the IC card (1). At least contacts (2) of the IC card which is being inserted come into contact with the cleaning member (5), so that stains deposited on the contacts (2) are removed.

Fig.7



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stained due to the long use of the cleaning means, it is not arranged in the IC card reader but attached to the outer surface of the shutter provided at the card inserting port, so that the cleaning means can be easily exchanged and its maintenance can be easily performed.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a plan view of a whole IC card reader in an embodiment of the invention and illustrates a state in which an IC card is inserted to a predetermined position;

Fig. 2 is a side elevational view of the IC card reader and illustrates a state in which a slide member and a contact member supporting member are omitted;

Fig. 3 is a front view of the IC card reader and shows a state in which a part of the shutter is omitted and the slide member and the contact member supporting member are omitted;

Fig. 4 is a cross sectional view taken along the line IV-IV in Fig. 1;

Fig. 5 is a cross sectional view taken along the line V-V in Fig. 1.

Fig. 6 is a cross sectional view taken along the line VI-VI in Fig. 1;

Fig. 7 is a cross sectional view taken along the line VII-VII in Fig. 1;

Fig. 8 is a cross sectional view taken along the line VIII-VIII in Fig. 1;

Fig. 9 is an enlarged diagram of the bottom surface of the contact member supporting member;

Fig. 10 is an enlarged diagram of a part of an IC card;

Figs. 11 to 13 are cross sectional views taken along the line XI-XI in Fig. 1 which are illustrated in accordance with the order of the operations.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Figs. 1 to 3, a frame 10 of an IC card reader is formed like a flat box shape whose whole surface is almost covered excluding only an inserting port 11. The frame 10 is made of a synthetic resin. Practically speaking, the frame 10 consists of an upper half body and a lower half body. These two bodies are coupled by proper fixing or bonding means, thereby constituting an integrated frame 10. An IC card passageway 12 extending laterally from side to side of the frame 10 is formed in the frame 10 in the range from the inserting port 11 to the end portion. As clearly illustrated in Fig. 3, a space portion 12a having a

height larger than a normal height of the gap, which corresponds to the thickness of the IC card 1, is formed in the passageway 12 in order to prevent the collision or scratch with the emboss formed on an IC card 1. Another space portion 12b having a height lower than the height of the portion 12a and larger than the normal height of the gap is also formed in the passageway 12 in order to likewise prevent the collision with a plurality of contacts 2 of the IC card 1 (in some of the IC cards, the contacts are slightly projected from the surface of the IC card). By forming the large space portions 12a and 12b in the passageway 12 in this manner, the IC card 1 can be smoothly inserted into the IC card reader without damaging the emboss and contacts of the IC card due to the collision with the inner surface of the passageway 12. The height of the other portions of the passageway 12 and the width of the whole passageway 12 are set so as to be substantially equal to thickness and width of the IC card 1, thereby guiding the IC card 1 so as to be smoothly inserted and ejected. The inserting port 11 has a tapered form which outwardly extends so that the IC card 1 can be easily inserted.

A plurality of bosses 8 to fix the frame 10 (i.e., the IC card reader) to the main body of an apparatus are formed at proper positions on both of the upper and lower plates of the frame 10 (in this case, the terms "upper" and "lower" are used when looking at Figs. 2 and 3 as the reference diagrams). Screw holes are formed in the bosses 8. The frame 10 is fixed by use of screws. In addition, a plurality of arc-shaped concave portions 9 for positioning are formed on both side surfaces of the frame 10. On the other hand, openings or holes or notches 13 to 18 are formed in the upper and/or lower plates of the frame 10 and these will be explained in detail hereinafter. Reference numeral 7 denotes reinforcing ribs which are respectively formed on both upper and lower plates of the frame 10.

Referring now to Fig. 7 together with Figs. 1 to 3, a shutter 4 is attached to the card inserting port 11. That is, in the upper portions of the both edge portions of the shutter 4, this shutter is fixed to axes 6. The axes 6 are rotatably supported to the frame 10 at both sides of the inserting port 11. Thus, the shutter 4 can swing around the axes 6 as a rotational center. When the IC card 1 is inserted, the shutter 4 is rotated such that the front edge of the IC card pushes and opens the shutter 4 toward the inside.

A cleaning member 5 is adhered to the surface (outside surface) on the side of the shutter 4 where the front edge of the IC card is come into contact and, if necessary, to the lower portion of the shutter 4. It is sufficient that the cleaning member 5 is

card 1. Eight contact members 50 are provided for the supporting member 40 so as to have substantially the same arrangement with that of the eight contacts 2. The IC card reader is designed in a manner such that each contact member 50 is located just over each corresponding contact 2 of the IC card 1 when the IC card 1 is inserted into the passageway 12 of the IC card reader and its front edge just abuts on the receiving projecting portion 33.

The connecting portions 50b of the contact members 50 projecting over the supporting member 40 are respectively connected to a wiring pattern of a flexible printed circuit board 51 to be led to the outside. A part of the printed circuit board 51 is fixed onto the supporting member 40 and passes through the notch 18 formed in the rear portion of the frame 10 and is led to the lower surface of the frame 10 and connected to a printed circuit board (not shown) attached to the lower surface of the frame 10.

Projections 43 are formed on both sides of the front portion of the supporting member 40. On the other hand, fixed cams 60 are disposed at the positions on both sides of the opening 13. Each of the fixed cams 60 has an upper horizontal cam surface 61 in the direction from the front to the rear, an inclined cam surface 62 which is backwardly downwardly slanted, and a lower horizontal cam surface 63. The projections 43 of the supporting member 40 come into contact with these cam surfaces.

The projections 43 adapted to come into contact with the cam surfaces are not necessarily provided for the supporting member 40. It is also possible to constitute such that both side portions of the supporting member 40 come into contact with the cam surfaces.

Referring now to Figs. 1 and 7, the opening 14 is formed in one side portion of the upper plate of the frame 10. An IC card fixing member 72 is enclosed in the opening 14. The fixing member 72 is fixed to one end of a leaf spring 71. The other end of the leaf spring 71 is inserted and fixed into a projection 24 formed on the frame 10. The fixing member 72 is downwardly urged by the leaf spring 71, thereby pressing the lower surface of the passageway 12. When the IC card 1 is inserted into the passageway 12, the front edge of the IC card 1 abuts on a slant surface 72a of the fixing member 72, so that the fixing member 72 is pushed up against the depressing force of the leaf spring 71. Thus, the fixing member 72 downwardly presses the upper surface of the IC card 1, thereby fixing the IC card 1 by the depressing force.

Referring to Figs. 1, 2, and 8, the hole 15 is formed in the upper plate in the rear portion of the frame 10 and a fixing member 73 is fitted into the

hole 15 so as to be freely vertically movable in a manner similar to the above. One end of a leaf spring 74 made of conductive material is inserted into a projection 26 formed on the frame 10. The fixing member 73 is attached to the other end of the leaf spring 74. The fixing member 73 is downwardly pressed by the leaf spring 74. The fixing members 72 and 73 are formed of a soft material or an elastic material so as to prevent the damage or scratch of the IC card.

One end of a contact member 75 made of a spring member and also made of a conductive material is fixed by being pushed into a concave portion 27 of the frame 10. The other end of the contact member 75 extends over the fixing member 73. Although the contact member 75 is downwardly pressed, a part of the other end portion thereof abuts on a convex portion 25 formed on the frame 10, so that the height position of the other end portion is determined. When the IC card 1 is inserted and reached to the rear end portion in the passageway 12, the fixing member 73 is upwardly pushed by the amount of the thickness of the IC card 1. Then, a part of the other end portion of the leaf spring 74 comes into contact with a part of the other end portion of the contact member 75, so that the leaf spring 74 is electrically connected with the contact member 75. Namely, a sensor to detect the insertion of the IC card to a rear end position of the passageway 12 is constituted by the fixing member 73, leaf spring 74 and contact member 75.

The sensor to detect the insertion of the IC card or the state in which the IC card has been inserted to a predetermined position is not limited to the foregoing constitution. For example, the fixing member can be dispensed with and instead, the other end of the leaf spring 74 is curved and formed into a downward arc-like shape.

The whole operation will now be described with reference to Figs. 11 to 13.

In Fig. 11, at the standby position (the IC card 1 has not been inserted, yet), the slide member 30 is returned to the front position by the force of the return spring 35 and is held at such a position that the receiving projecting portion 33 abuts on the front edge of the opening 16 or the front portion of the slide member 30 abuts on the front edge of the shoe portion 22 or opening 13. The rear end portion of the contact member supporting member 40 is also upwardly lifted by the force of the spring 35 and the supporting member 40 is held at such a position that the projection 43 abuts on the upper horizontal cam surfaces 61 of the fixed cams 60.

Next, when the IC card 1 is inserted into the card inserting port 11, the shutter 4 is pushed and opened inwardly from the front edge of the IC card. While the IC card 1 is being inserted, the contacts 2 of the upper surface of the IC card 1 are in

Claims

1. An IC card reader comprising:
a shutter (4) which is attached to an inserting port
(11) of the IC card reader so as to be freely
opened and closed and which can be opened by a
pressing force of an IC card (1) inserted; and
cleaning means (5), provided on an outer surface
of said shutter, for cleaning at least contacts (2) of
the IC card by coming into contact with said con-
tacts when the IC card is being inserted.

2. An IC card reader according to claim 1,
wherein said shutter is supported by an axis (6) at
an upper edge portion of the shutter so as to freely
swing, and the shutter swings inwardly of the IC
card reader by the inserting operation of the IC
card, thereby opening the inserting port.

3. An IC card reader according to claim 1,
wherein a stopper (11a) to inhibit the outward
opening of the shutter is provided at the inserting
port.

4. An IC card reader according to claim 3,
wherein said shutter is pressed outwardly by an
elastic member.

Fig.2

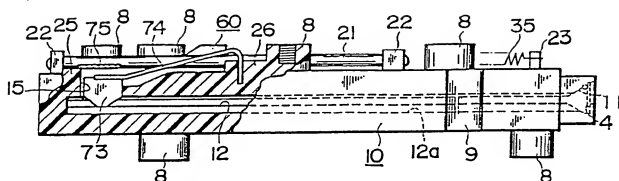


Fig.8

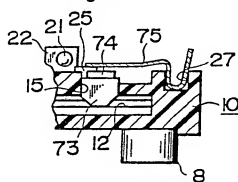


Fig.7

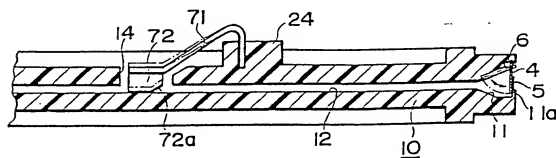


Fig.9

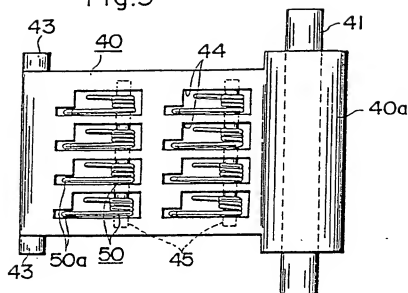


Fig.10

